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## The chemical stain removal properties of 'whitening' toothpaste products: studies in vitro.

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**Abstract**

**BACKGROUND:** A considerable number of toothpastes are available as tooth whitening products. Most appear to contain ingredients that might remove extrinsic stains rather than change natural tooth colour. Extrinsic stain removal could be achieved by physical or chemical means.

**AIM:** The purpose of this study was to measure the chemical stain removal properties of a range of whitening toothpaste products and experimental formulations using a standardised method in vitro.

**MATERIALS AND METHOD:** 5 separate studies were conducted involving a total of 39 agents of which 28 were whitening products, 7 were experimental formulations, 2 were oxidising mouthrinses used as positive controls, 1 a popular fluoride toothpaste product as a benchmark control, and 1 was water as the negative control. The formulae and controls varied in each study. The stain model was saliva/chlorhexidine/tea stain developed on optically clear to an optical density of at least 2.0. Groups of stained specimens were exposed to standard slurries or solutions of test agent for 1 minute periods up to 5 minutes. Optical density readings were taken at each 1 minute time point. Analyses were based on per cent stain remaining after 5 minutes and time to 75% stain remaining.

**RESULTS:** 3 toothpaste products achieved 100% stain removal by 5 minutes; 2 of these in 3 out of 4 studies in which they were used. 4 experimental formulations also achieved 100% stain removal. In general agents with high total stain removal also had short times to 75% stain remaining. The majority of agents tested had low total chemical stain removal and prolonged times to 75% stain remaining. A few agents were little different from water and several similar in effect to the conventional fluoride toothpaste. This method in vitro tests agents under the best case scenario conditions for chemical stain removal.

**CONCLUSION:** Only a small number of the whitening toothpaste products have good chemical stain removal potential, the majority are unlikely to achieve their claimed benefits through chemical stain removal. There is clearly a need for further data on the actual effects of such products using both methods in vitro and particularly in vivo or in situ.

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